

REMARKS/ARGUMENTS

Favorable reconsideration of this application is requested in view of the above amendments and in light of the following remarks and discussion.

Claims 1, 3-17, 49, 51, and 53-56 are pending. Claims 1, 49, 53, and 54 are amended. Claims 2, 18-34, 50, and 52 were canceled previously. Claims 35-48 are canceled without prejudice or disclaimer by the present amendment. Claims 55-56 are newly added. Support for the amendment to Claim 1 can be found in now-canceled dependent Claim 2 and in the published application in numbered paragraph [0100], for example. Support for the amendment to Claim 49 can be found in numbered paragraph [0100] and in Fig. 2, for example. Support for the amendment to Claim 53 can be found in original Claim 3, for example. Support for the amendment to Claim 54 can be found in Fig. 1, for example. Support for newly added Claims 55 and 56 can be found in Figs. 4 and 20, for example. No new matter is added.

In the outstanding Office Action, Claims 1, 3-4, 8-9, 11-12, 14-17, and 54 were rejected under 35 U.S.C. § 103(a) as obvious over JP 10-321528 ("JP '528"). Claims 5-7, 10, 13, and 35-48 were rejected under 35 U.S.C. § 103(a) as obvious over JP '528 in view of Japanese Patent No. 2001-176807 ("JP '807") and Japanese Patent No. 2001-131753 ("JP '753"). Claims 49, 51, and 53 were rejected under 35 U.S.C. § 102(b) as anticipated by JP '528.

Regarding the rejection of independent Claim 1 as obvious over JP '528, that rejection is respectfully traversed by the present response.

Rejections under 35 U.S.C. § 103(a)

Applicants wish to direct the Examiner's attention to basic requirement of a *prima facie* case of obviousness as set forth in the MPEP § 2143. This section states that to establish a *prima facie* case of obviousness, three basic criteria first must be met. First, there

must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine the references teachings. Second, there must be a reasonable expectation of success. Finally, the prior art references (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in Applicants' disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Section 2143.03 states that all claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1998).

By way of review, Claim 1 is directed to a method of cleaning a substrate-processing apparatus. The method includes elevating a temperature of the inner chamber higher than that when processing thereof; exhausting a space between the inner chamber and an outer chamber to reduce a pressure of the space below an atmospheric pressure such that heat transferred to the outer chamber is reduced; supplying a cleaning gas; and removing substances while cooling the outer chamber.

JP '528 describes a semiconductor processing apparatus configured to prevent the strength of a reaction pipe (1) (corresponding to the inner chamber of the present invention) from being weakened by a gas cleaning, thereby improving a device operating rate (see abstract). The reaction pipe (1) is repeatedly cleaned by a cleaning gas after depositing. The cleaning process causes microcracks on the surface of the reaction pipe (1). An atmospheric

pressure applied to the reaction pipe (1) and a heat stress may grow the microcracks such that the reaction pipe (1) is ruptured (see [0005]).

To solve this problem, JP '528 further provides a protection pipe (5) accommodating the reaction pipe (1) therein. A pressure of a gap (12) between the reaction pipe (1) and the protection pipe (5) is controlled to be substantially **equal** to that of the reaction pipe (1). JP '528 benefits from this arrangement because atmospheric pressure is not applied to reaction pipe (1), thereby preventing microcracks from growing. JP '528 describes, in paragraph [0023] of the English translation, a method of cleaning the reaction pipe (1). The cleaning method of JP '528 includes the step of controlling the pressure of the space (12) to be substantially equal to the pressure of the reaction pipe (1).

The following steps of the cleaning method are performed while maintaining the above pressure condition. A wafer (2) is installed in the reaction pipe (1). A cleaning gas is supplied into the reaction pipe (1) through a gas supplying hole (4La) or (4Ra). At the same time, the cleaning gas is exhausted through a gas exhausting hole (4Rb) or (4Lb) which is located on the opposite side across the wafer (2). Therefore, the cleaning gas flows along the surface of the wafer (2).

The cleaning method recited in Claim 1 is different from that of JP '528 for at least the following reasons.

First, the cleaning method of the present invention includes the step of elevating the temperature of the inner chamber when cleaning the substrate **higher than** that maintained while processing the substrate. Therefore, the cleaning can be performed efficiently.

In contrast, JP '528 is silent regarding the step of elevating the temperature of the reaction pipe (inner chamber) (1). In particular, JP '528 is **silent regarding whether the temperature of the reaction pipe (inner chamber) (1) when cleaning the wafer is higher than that when processing the wafer.**

Second, the cleaning method recited in Claim 1 includes the step of exhausting the space between the inner chamber and an outer chamber to maintain a pressure of the space lower than that outside the outer chamber such that heat transferred to the outer chamber is reduced.

One benefit of this arrangement is that, even though the temperature of the inner chamber gets to be very high, the temperature of the outer chamber can be maintained low. Therefore, the outer chamber can be made of metals which have a high toughness but a low melting point.

In contrast, JP '528 merely describes that the pressure of the gap chamber (space) (12) between the reaction pipe (inner chamber) (1) and the protection pipe (outer chamber) (5) is controlled to be substantially equal to that of the reaction pipe (inner chamber) (1). In other words, the gap chamber (space) (12) between the reaction pipe (inner chamber) (1) and the protection pipe (outer chamber) (5) might be exhausted when a pressure of the gap chamber (space) (12) is higher than a pressure of the reaction pipe (inner chamber) (1).

When the pressure of the gap chamber (space) (12) is lower than the pressure of the reaction pipe (inner chamber) (1), air might be inhaled into the gap chamber (space) (12). Further, when the pressures are equal to each other, neither exhausting nor inhaling may happen. In short, JP '528 merely describes an extensive step including exhausting, inhaling, and a static state. Therefore, JP '528 fails to disclose the step of exhausting the gap chamber (space) between the reaction pipe (inner chamber) (1) and the protection pipe (outer chamber) (5) to maintain a pressure of the space to be lower than the pressure outside the outer chamber.

Further, in the invention recited in independent Claim 1, reducing the pressure of the space provides a benefit of reducing a heat transfer to the outer chamber. If the heat transfer

is low enough, the outer chamber may be made of certain preferred metals that would be unusable.

However, in JP '528, a heater (3) is installed on the outside of the protection pipe (5). Heat from the heater (3) is transferred to the reaction pipe (1) through the space (12) between the reaction pipe (1) and the protection pipe (5). That is, in JP '528, heat transfer through the gap chamber (12) is required to be performed efficiently in order to elevate the temperature of the reaction pipe (1).

Therefore, a person of ordinary skill in the art would have been led away from exhausting the space (12) in JP '528 to a pressure lower than that outside the outer chamber in JP '528 because exhausting this space to such a low pressure would impair the heat transfer JP '528 requires to occur through the space (12).

Thirdly, amended independent Claim 1 recites the step of removing substances while **cooling the outer chamber**. As acknowledged in the outstanding Office Action, JP '528 does not teach the cooling step.¹

The Office Action asserts that "it would have been obvious for one skilled in the art to adjust the temperature to obtain optimum results".² However, in JP '528, the heater (3) is installed at the outside of the protection pipe (5) and heat from the heater (3) is transferred through the protection pipe (5). JP '528 intends to efficiently transfer **heat** to the reaction pipe (1). Therefore, **the protection pipe (5) should not be cooled**. Accordingly, considering such configuration, one skilled in the art would not have been led to modify JP '528 such that the protection pipe (5) would be **cooled** during the step of the removing substances.

Each of Claims 3-17 depends, directly or indirectly, from amended independent Claim 1 and patentably distinguishes over JP '528 for at least the same reasons as amended independent Claim 1 does.

¹ Outstanding Office Action, page 2.

² Outstanding Office Action, page 2.

JP '807 fails to remedy the deficiencies discussed above regarding amended independent Claim 1 and JP '528. Rather, the outstanding Office Action relies on JP '807 for the feature of particular gases used in the cleaning process. JP '807, as shown in Figs. 1 and 5, does not teach or suggest exhausting a space between an inner chamber and an outer chamber that accommodates the inner chamber to maintain a pressure of the space to be lower than that outside the outer chamber.

JP '553 fails to remedy the deficiencies discussed above regarding JP '528. The outstanding Office Action relies on JP '553 for the feature of exhausting an inside of an inner chamber with a different exhausting system than one used for exhausting the inner chamber during processing of a substrate.³ However, JP '553 does not teach or suggest exhausting a space between an inner chamber and an outer chamber that accommodates the inner chamber to maintain a pressure of the space to be lower than that outside the outer chamber as recited in amended independent Claim 1. Accordingly, Applicants respectfully submit that amended independent Claim 1 patentably distinguishes over any proper combination of JP '528, JP '807, and JP '553 for at least the reasons discussed above.

Each of Claims 3-17 depending, directly or indirectly, from amended independent Claim 1 patentably distinguishes over any proper combination of the cited references for at least the reasons discussed above.

Dependent Claim 54 recites that the substrate processing apparatus further comprises a **cooling unit** for cooling the outer chamber, being installed to the outer chamber. One benefit of this arrangement is that it is possible to perform the step of removing substances to be cleaned off which are adhered to an inside of the inner chamber, while cooling the outer chamber. Accordingly, as discussed above, more materials are available for making the outer chamber.

³ Outstanding Office Action, page 3.

In contrast, JP '528 is silent regarding a cooling unit installed to the protection pipe (outer chamber) (5). In JP '528, the protection pipe (5) is **directly heated by the heater (3)**, and the reaction pipe (1) is indirectly heated through the heated protection pipe (5). If a cooling unit were installed to the protection pipe (5) to cool the protection pipe (5), the reaction pipe (1) would not be heated. Accordingly, a person of ordinary skill in the art would not have been led by JP '528 to include the cooling unit recited in dependent Claim 54.

Rejection under 35 U.S.C. § 102(b)

Applicants wish to direct the Examiner's attention to MPEP § 2131 which states that to anticipate a claim, the reference must teach every element of the claim.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ...claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990).

The substrate processing apparatus in accordance with Claim 49 includes an inner chamber, an outer chamber, a cleaning gas supplying unit, a chamber heater for heating the inner chamber, an exhaust unit for exhausting a space between the inner chamber and the outer chamber. A chamber heater is installed **between** the inner chamber and the outer chamber.

In contrast, the heater (3) of JP '528 is installed outside the protection pipe (outer chamber) (5). Therefore, the configuration recited in amended independent Claim 49 is different from that of JP '528. Further, as discussed above, JP '528 intends for heat transfer to occur through the space (12) from outside the protection pipe (5), and therefore, JP '528

already provides heating without placing a heater in the location recited in amended independent Claim 49. Accordingly, Applicants respectfully submit that the rejection should be withdrawn.

It is also respectfully submitted that Claims 51 and 53, directly or indirectly depending from Claim 49, patentably distinguish over any proper combination of the cited references for at least the same reasons indicated with respect to Claim 49 and further because of the additional features recited therein which, when taken alone or in combination with the features recited in Claim 49, further patentably distinguish over the cited references.

Newly Added Dependent Claims

Newly added dependent Claim 55 recites that the exhausting of the space between the inner chamber and outer chamber begins **before** elevating the temperature of the inner chamber higher than that maintained while processing the substrate.

Newly added dependent Claim 56 recites heating the inner chamber **while** cooling the outer chamber.

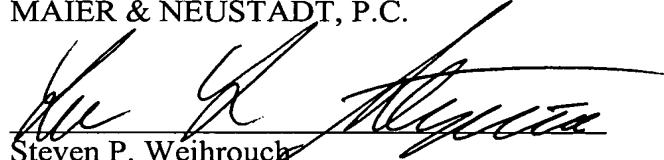
Applicants respectfully submit that newly added dependent Claims 55 and 56 patentably distinguish over any proper combination of the cited references for at least the same reasons as Claim 1 does as well as for their own features.

For the foregoing reasons, it is respectfully submitted that this application is now in condition for allowance. A Notice of Allowance for Claims 1, 3-17, 49, 51, and 53-56 is earnestly solicited.

Should Examiner El Arini deem that any further action is necessary to place this application in even better form for allowance, Examiner El Arini is encouraged to contact Applicants' undersigned representative at the below-listed telephone number.

Respectfully submitted,

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